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The impact of contractual emission factors on the accuracy and relevance of corporate greenhouse gas accounts

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Abstract

Companies are increasingly using Renewable Energy Certificates (RECs) or equivalent instruments to claim that their electricity demand is met by renewable generation and their corresponding (scope 2) emissions are zero. However, evidence suggests that in many countries purchasing REC-type instruments does not cause the generation of renewable electricity, and this raises questions about what scope 2 inventories based on such instruments mean. This article uses a number of thought experiments, as well as analysis of how activity-specific emission factors are normally used, to explore the implications of using contractual factors. The analysis shows that contractual emission factors that do not represent some form of causal relationship undermine the accuracy and relevance of greenhouse gas accounts. Existing scope 2 guidance does not adequately consider the impact of using contractual factors on the accuracy and relevance of accounts (despite these being established greenhouse gas accounting principles). The implications of the findings for future guidance are that only contractual factors that represent a causal relationship should be used for calculating scope 2 emissions.
Introduction

The aim of this paper is to explore the impact of using contractual emission factors for electricity on the accuracy and relevance of the information in greenhouse gas accounts. There are a number of reasons why this is an important issue. Firstly, electricity emissions often constitute a large proportion of total emissions in corporate greenhouse gas accounts, and inaccuracies can potentially represent large quantities of emissions that are misreported or left unmanaged. Secondly, there is a growing market for Renewable Energy Certificates (RECs) and other instruments associated with contractual emission factors. For example, the market for RECs in the US grew from just over 10 million MWhs in 2006 to approximately 40 million MWhs in 2011 (Heeter et al. 2012). Thirdly, the Greenhouse Gas Protocol (one of the leading developers of standards for greenhouse gas accounting) is currently developing guidance on scope 2 accounting and the use of contractual emission factors (WBCSD/WRI 2013), but it is not yet clear whether the guidance will sufficiently address the impact of using contractual factors on the quality of the information in greenhouse gas accounts.

There are a number of possible issues with the use of contractual emission factors for scope 2 emissions, including:

1. Double-counting: this can occur if a reporting company uses a contractual emission factor for a specific generation technology, such as renewables, but the emissions from the technology are also reported by other reporting companies (e.g. if the generation technology is included in the calculation of a grid average emission factor, which is used by other reporting companies).

2. Causality: there is evidence that in many jurisdictions there is not a causal-link between purchasing RECs or other instruments and the generation of renewable electricity (Gillenwater 2008; Gillenwater 2013b; Markard & Truffer 2006; Raadal et al. 2012; Gillenwater et al. 2014; Gillenwater 2013a), in which case using a contractual emission factor will not reflect the emissions caused by the reporting company. This raises questions about what the reported emissions figures mean.

The forthcoming guidance from the Greenhouse Gas Protocol is expected to address the issue of double-counting by requiring the use of residual grid mix factors which exclude any emissions already allocated via contractual factors. However, it is not clear that causality or the meaningfulness of reported results will be addressed in the guidance. This article focuses on the issue of causality, and

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1 Scope 2 emissions are those from the generation of imported electricity, steam, heating, or cooling (WBCSD/WRI 2004).
provides an analysis of the impact of contractual emission factors on the information in greenhouse gas accounts.

Section 1 initiates the discussion by posing the question of what scope 2 inventories mean when contractual emission factors (that do not represent a causal relationship) have been used. Section 2 provides two thought experiments to explore the impact of using contractual emission factors on accuracy and relevance. Section 3 presents a further thought experiment in which contractual emission factors are used for calculating emissions from other activities (other than electricity consumption). Section 4 discusses the nature of activity-specific emission factors generally, and the implications for scope 2 accounting. Section 5 presents an analogy with biofuel usage, and distinguishes between cases where there is a causal relationship and cases where there is not. Section 6 provides a general discussion bringing together the key points identified in the preceding sections. Finally, a number of conclusions are presented, including recommendations on the use of contractual emission factors.

In order to maintain the focus and brevity of the article an additional issue is discussed in Appendix I, relating to the possibility that purchasing RECs or other instruments will cause an increase in renewable generation in the future.

Section 1. What do scope 2 accounts that use contractual factors mean?

The contractual emission factors associated with RECs (or equivalent instruments) are 0tCO₂e/MWh, as renewables create zero emissions at the point of generation. An initial question for exploring the impact of using contractual factors on greenhouse gas accounts is: What do the reported zero tonnes of CO₂e mean?

Firstly, the electromagnetic energy consumed via a transmission and distribution grid cannot be traced to specific generation technologies (Raadal 2013), and so reporting zero tonnes of CO₂e does not mean that the electricity consumed physically came from a renewable source.

Secondly, as noted above, there is evidence that in many jurisdictions purchasing RECs or other instruments does not cause the generation of renewables (Gillenwater 2008; Gillenwater 2013b; Markard & Truffer 2006; Raadal et al. 2012; Gillenwater et al. 2014; Gillenwater 2013a). This can be for a number of reasons, for instance the amount of risk-adjusted revenue from the sale of RECs may be too small to affect investment decisions, or the amount of renewables is driven by other factors such as regulatory requirements or the legacy of investments that occurred prior to the development
of the RECs market. In such cases the reporting company’s electricity consumption contributes to aggregate demand for electricity generation in exactly the same way as any other company that consumes electricity. Reporting “zero tonnes of CO$_2$e” does not mean that the reporting company purchasing RECs has caused the generation of renewable electricity, nor that it has caused any fewer emissions than an equivalent company that has not purchased RECs.

One immediate problem for scope 2 accounts (that are based on contractual factors) is that they appear to be misleading. Reporting “zero tonnes of CO$_2$e” suggests that the company has caused fewer emissions than an equivalent company that does not use contractual factors – but this is not true.

Section 2 - Two thought experiments

This section presents two simple thought experiments to explore the impact of using contractual emission factors (that do not reflect an underlying causal relationship) on the quality of the information in greenhouse gas accounts. Quality here is understood in terms of the accuracy of the information and its relevance to decision making (two of the core accounting principles in the Greenhouse Gas Protocol Corporate Standard (WBCSD/WRI 2004)).

**Thought Experiment 1**

Company A purchases RECs and uses the associated contractual emission factor to report its scope 2 emissions as zero. In the jurisdiction in question the RECs market does not influence the amount of renewable generation. Company B decides not to purchase RECs but decides to undertake an energy efficiency programme instead.

An environmentally conscious consumer looks at the information in Company A’s and Company B’s greenhouse gas accounts and decides to use Company A as it appears to have lower emissions. However, Company B actually causes fewer emissions as it contributes less to aggregate demand for electricity. The information in Company A’s accounts does not appear to be an accurate reflection of the emissions caused by its activities, and the information is not relevant for good decision making.

**Thought Experiment 2**

Company A purchases RECs and uses the associated contractual factor to report its scope 2 emissions as zero. In the jurisdiction in question the RECs market does not influence the amount of renewable generation. Company A undertakes an energy efficiency programme and Company A’s management
team look at the greenhouse gas accounts to evaluate how effective the programme is at reducing emissions. Because the emissions from electricity consumption are reported as zero every year the accounts do not show any change in emissions, and the management team conclude that the programme is not reducing emissions and cancel it.

In actual fact the energy efficiency programme was reducing demand for electricity generation, and was reducing emissions, but the information in the greenhouse gas accounts did not accurately reflect this. Nor was the information relevant for good decision making.

The key point that can be taken from these two thought experiments is that the accuracy and relevance of the information in greenhouse gas accounts are undermined if the accounts do not reflect the emissions caused by the reporting company’s activities. This point is illustrated and explored further in subsequent sections.

**Section 3 - Using contractual factors for other emission sources**

This section analyses the nature of contractual emission factors by considering what would happen if contractual factors were used more widely in greenhouse gas accounting, i.e. for other emission sources. The question is: If contractual factors can be used for electricity consumption then why not for other emission-generating activities too?

Consider the case in which Company A combusts natural gas in its boiler, generating 100 tCO$_2$e. Company B uses an equivalent amount of bio-methane in its boiler, generating 0 tCO$_2$e. Company A signs a contract with Company B so that Company A can use the emission factor associated with bio-methane, and Company B uses the emission factor for natural gas. For the purposes of this example, the existence of the contract did not cause Company B to use bio-methane.

This is equivalent to the situation with contractual emission factors for renewable electricity in that there is no double-counting or under-reporting of emissions, and the reported emissions are decoupled from the physical processes that generate the emissions. As with RECs and other instruments in many jurisdictions, the purchase of the contractual emission factor does not cause the generation of renewable energy.

However, if Company A’s greenhouse gas accounts state that the emissions from its natural gas consumption are 0 tCO$_2$e, this would not look like an accurate account of actual emissions. Similarly, it would not be accurate for Company B to report 100 tCO$_2$e from its bio-methane usage. One could extend the thought experiment to imagine a world in which all corporate greenhouse gas accounts
were based on contractual emission factors, and companies could contract to report each other’s emissions, provided there was no double-counting. It is difficult to conceive the meaningfulness of such accounts, or what they could be used for? The absurdity of using contractual factors (that do not reflect some causal relationship) helps to tease out the absurdity of using them for electricity consumption as well.

A key point from this thought experiment is that the use of emission factors that do not reflect some underlying causal relationship results in accounts that are not accurate, or even meaningful.

Section 4 – Activity-specific emission factors

The contractual emission factors associated with RECs, or equivalent instruments, are effectively activity or technology-specific emission factors - i.e. they represent the emissions from a specific technology (in the case of RECs etc, renewable electricity technologies). This section considers the circumstances in which using activity/technology-specific emission factors are appropriate, and identifies the implications for the use of contractual factors for renewable electricity.

Consider the case of activity-specific emission factors for economy class and business class flights. The emission factors for economy class flights are lower than the factors for business class flights as economy class seating allows for greater passenger loading and therefore lower emissions per passenger. There is a causal relationship between the activity (i.e. using an economy class seat) and the resulting emissions. In contrast, consider the case of using a lower activity-specific emission factor for a seat near the window of the aeroplane, rather than near the aisle. There is no causal relationship between emissions and proximity to the window, and using an activity-specific emission factor based on sitting near the window does not appear to be justified.

Using a contractual emission factor associated with a REC that does not cause the generation of renewable electricity is equivalent to using an activity-specific emission factor for sitting near the window on an aeroplane. If the use of activity-specific emission factors is only justified when the activity in question has a causal relationship with the level of emissions claimed, then using contractual emissions is not justified when purchasing RECs does not cause the generation of renewable electricity.

Section 5 – Distinguishing between cases with and without causality

A final thought experiment is intended to further explore the distinction between cases where there is a causal relationship and cases where there is not.
Consider the situation in which an airline uses 50% biofuels in its aeroplanes. Passengers who want to reduce their emissions can pay a premium to have the biofuel emissions allocated to them (and report their point-of-combustion business travel emissions as zero), and the remaining passengers can report the residual emissions. Now consider two different scenarios:

Scenario 1. The airline has to use 50% biofuels due to a regulatory obligation, and paying the premium does not cause the use of the biofuels.

Scenario 2. The airline only uses the biofuels if a sufficient number of passengers pay the premium, and therefore paying the premium causes the use of the biofuels.

In Scenario 1 there is nothing about the premium-paying passengers’ activities that causes a different amount of emissions from the non-premium paying passengers’ activities (all that is happening is that the fossil emissions are shuffled onto the non-premium paying passengers), whereas in Scenario 2 there is a difference in the emissions caused by each group. For premium-payers in Scenario 2, reporting 0 tCO₂e for the emissions from the flight would be an accurate account of the emissions caused, whereas in Scenario 1 it would not. The same distinction holds for calculating electricity emissions using contractual factors.

In order to know whether using contractual emission factors is appropriate (or will undermine the accuracy and relevance of the greenhouse gas accounts) it is essential to know whether purchasing RECs causes the generation of renewable electricity or not.

Section 6 – Discussion

The analysis presented in the preceding sections clearly shows that using contractual emission factors (that do not reflect some underlying causal relationship) undermines the accuracy and relevance of the information in greenhouse gas accounts, and that the use of contractual factors is only appropriate when there is an underlying causal relationship.

A first point to note is that these findings do not reflect well on the current practice of using contractual factors for scope 2 reporting. Current practice either involves reporting a single result based on a contractual factor, or involves reporting an additional scope 2 result using a grid average factor (known as dual reporting). In either case, there is generally no consideration given to whether the contractual factors represent a causal relationship, nor whether the information generated is accurate and relevant.
The current approach required by the Carbon Disclosure Project (CDP) involves reporting a single emissions result for scope 2 (Carbon Disclosure Project 2013), though coupled with a requirement to disclose the amount of electricity consumption covered by contractual factors. However, there is no requirement that the contractual factors represent a causal relationship, and no consideration is given to the accuracy or relevance of the resulting information.

It is anticipated that the forthcoming guidance from the Greenhouse Gas Protocol will require some form of dual reporting, but as with the CDP, it appears that there will not be any differentiation between contractual results that provide accurate and relevant information and those that do not. The outcome is likely to be the widespread use of non-causally related contractual factors, and inaccurate and irrelevant greenhouse gas accounts. The dual reporting of grid average results could partially mitigate this problem but only if the users of the accounts are aware that the contractual results are not accurate or relevant - in which case why report the contractual results at all?

Moving on to a separate issue, it may be suggested by advocates of contractual emission factors that although purchasing RECs or other instruments may not cause the generation of renewable electricity at present, if aggregate demand for such instruments increases above existing levels of supply then there may be an effect on the level of renewable generation in the future (and the requirement for causality would be met). However, there are a number of problems with this view: firstly even if the existing supply threshold is reached there will be a misalignment between the electricity for which there is a claimed causal relationship and the actual amount of renewables caused by the purchase of RECs; secondly, there is no precedent within attributional greenhouse gas accounting for allocating emissions on the basis of possible future effects that may occur after the reporting period; thirdly the existing supply threshold might never be reached, and the promised future justification for current emission allocations may never materialise; and finally, if the existing supply threshold is reached then the cost of RECs will have to reflect the true marginal cost of supporting renewables, and the resulting increase in price is likely to stall demand at precisely the point at which purchasing RECs might cause a change in the amount of renewables. A more detailed discussion on this issue is provided in Appendix I.

Another issue that is worth noting in the present discussion is that there is a misconception that corporate greenhouse gas accounting is not concerned with causation, but only with allocating emissions between reporting entities (for examples, see Raadal 2013; Carbon Disclosure Project 2013). The analysis presented in Sections 1 to 5 clearly shows that greenhouse gas accounts must reflect the emissions caused by the reporting company in order to be accurate and relevant. Causality
can also be seen in the practice of using the concepts of “control” (WBCSD/WRI 2004; WBCSD/WRI 2011) or “responsibility” (UK Government 2008; UK Government 2013) for determining the scope of greenhouse gas accounts, and in adhering to “cause-effect” relationships when allocating emissions (Pelletier et al. 2013). If corporate accounting were only about allocating emissions while avoiding double-counting it would be possible for different companies to report each other’s emissions, but as discussed in Section 2 it is not clear what such accounts would mean or how they could be used.

A further point to note is that the analysis presented in this article shows that causality is a necessary condition for the use of contractual factors. However, there are remaining questions concerning the sufficient conditions for using contractual factors. For instance, is it appropriate to use contractual emission factors for generation technologies that are not connected to the grid that supplies the electricity consumed, even if there is a causal relationship? The condition of causality will be met, but there will be a departure from the notion of physical connectedness which underpins environmental accounting. Further exploration of the sufficient conditions for using contractual factors is needed.

A final point of discussion is the question of why, from a climate change mitigation perspective, a reporting company would wish to purchase RECs or other instruments if they only reallocate existing renewable capacity and do not cause the generation of renewable electricity? Quite apart from the detrimental impact on the quality of the information in the greenhouse gas accounts, purchasing such instruments do not reduce the level of greenhouse gas emissions to the atmosphere, and have no climate change mitigation benefits.

**Conclusion and Recommendations**

The main conclusion from the thought experiments and other analysis presented above is that greenhouse gas accounts must reflect the emissions caused by the reporting company to be accurate and relevant. Based on this conclusion it is recommended that contractual factors that do not represent a causal relationship should not be used for scope 2 reporting. This finding should be clearly reflected in future guidance on scope 2 accounting, and existing guidance that undermines the accuracy and relevance of greenhouse gas accounting should be rescinded.
Appendix I - Potential future causation and the use of contractual emission factors

In many jurisdictions there is likely to be an existing level of renewable supply which is independent of demand for RECs, particularly where renewable generation is determined by factors such as existing regulatory mandates, subsidies, or legacy infrastructure. This quantity of supply creates a threshold effect in the relationship between demand for RECs and the creation of new renewable capacity, illustrated in Figure 1. If the level of demand for RECs is below $Q^1$, demand will not influence the supply of renewables.

![Figure 1. Threshold effects in the amount of renewables supplied](image)

However, if demand exceeds the renewable supply threshold then demand will influence the level of supply. This raises the question: Does the possibility of a future causal impact justify the use of contractual emission factors for current reporting periods? There are a number of reasons why possible future causal impacts do not justify the use of contractual emission factors.

Firstly, even when demand exceeds the supply threshold there will be a misalignment between the amount of renewable generation for which there is a claimed causal relationship and the actual amount of renewables caused by the purchase of RECs (see Gillenwater, 2008 for a more detailed account of this misalignment). The amount of supply caused by the purchase of RECs will only be the amount beyond $Q^1$, whereas the amount of causation “claimed” via the use contractual emission factors will include the supply between zero and $Q^1$ (with which there is not a causal relationship). This is the equivalent of emissions allocation “hot air”, and will impact on the accuracy and relevance
of the greenhouse gas accounts that do not reflect the emissions caused by the reporting companies in question.

Secondly, attributional accounting is a “descriptive” or “monitoring” method (Joint Research Centre 2010), in the sense that activity data are collected for processes that occur during the reporting period, and emissions are allocated based on existing relationships. There is no precedent in accepted environmental accounting practices for allocating emissions based on future processes or effects that occur after the reporting period. If market-based causal relationships are used to justify the application of activity-specific emission factors, they should be based on causal relationships that exist during the reporting period, i.e. only the amount of renewable generation that is caused by the purchase of RECs at the time of the reporting period can be eligible for allocation via contractual emission factors.

A final consideration is that demand may never exceed the existing supply threshold, in which case the promise of future causation is never realised, and greenhouse gas accounts that have used contractual emission factors will not even reflect a future causal relationship. One reason for suspecting that this situation is likely to arise is that once the existing supply threshold is reached the price of RECs will have to reflect the actual cost of developing additional renewables, rather than just the transaction costs associated with certifying and brokering existing capacity (Gillenwater, 2008). Higher prices are likely to flatten the demand for RECs, as illustrated in Figure 2 below.

Figure 2. Threshold effects in the amount of renewables supplied

![Threshold effects in the amount of renewables supplied](image)
References


Raadal, H.L. et al., 2012. The Interaction Between Electricity Disclosure and Tradable Green Certificates. Energy Policy, 42, pp.419–428. Available at:


